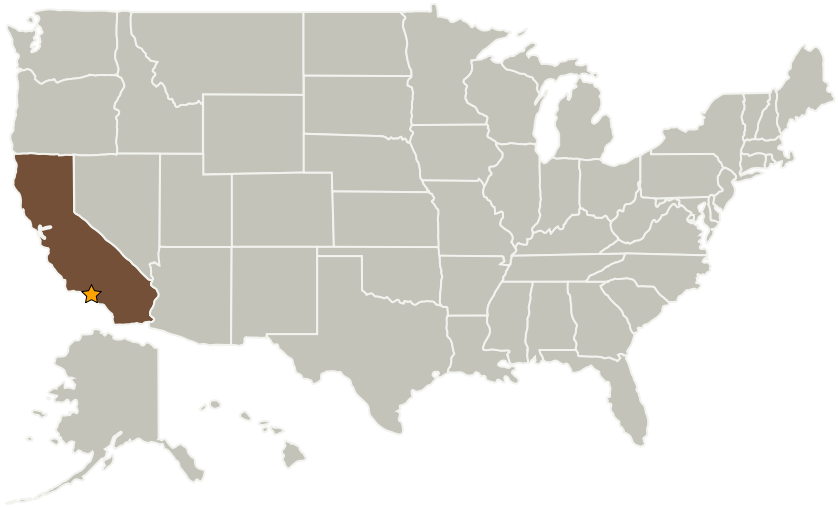
A 4-Kelvin Pulse-Tube/Reverse-Brayton Hybrid Cryocooler, Phase I

Completed Technology Project (2006 - 2006)

Project Introduction

NASA's ability to perform cutting edge space science, including lunar and planetary exploration, requires the use of cryogenically cooled detectors and sensors for advanced scientific instruments and telescopes. For example, to improve the signal-to-noise ratio of cryogenic IR focal plane arrays it is desirable to have on-focal plane, high-resolution, analog-to-digital data converters. Such A/D converters and supporting technology are currently in various stages of development. These and other detectors and sensors will require improvements in cryogenic system technology, including the development of lightweight, low vibration, highly-efficient, long-life cryocoolers if their useful lifetime is to be extended beyond a couple of years. To address these requirements, Atlas Scientific proposes to develop a 4K cryocooler that combines the efficiency of a recuperative, reverse-Brayton, low-temperature stage with the simplicity of a regenerative, pulse-tube, upper stage. The PT/RB hybrid is an innovative cooling system capable of achieving temperatures in the range of 4 to 10 K and is ideally suited to the requirements of many future space-based applications. The hybrid system addresses the issues of cryocooler vibration, reliability, and efficiency, while simultaneously providing an innovative approach to the challenge of interfacing a cryocooler with low-temperature detectors, sensors, and electronics.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
Atlas Scientific	Supporting Organization	Industry	San Jose, California

Primary U.S. Work Locations
California

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.1 Cryogenic Systems
    - TX14.1.3 Thermal Conditioning for Sensors, Instruments, and High Efficiency Electric Motors